



Bovine Tuberculosis

in Michigan

*A Guide for
Livestock Producers*

Michigan Department of Agriculture
Michigan Department of Community Health
Michigan Department of Natural Resources
Michigan State University
United States Department of Agriculture

What is Bovine Tuberculosis?

Bovine tuberculosis (TB) is an infectious disease caused by bacteria called *Mycobacterium bovis*. In Michigan, bovine TB infection has been seen primarily in cattle and deer. Bovine TB has also been found in elk, bison, carnivores such as coyotes, and in small mammals such as raccoons and opossums. It can infect any warm-blooded animal, including humans.

Why is bovine TB eradication necessary?

Bovine TB is not only an incurable and fatal disease of wild and domestic animals, it is also a zoonotic disease, meaning that people can also become infected. Two people in Michigan have been infected with the same strain of bovine TB that infects our cattle and deer.

As of summer 2008, Michigan is one of three states in the U.S. that is not considered bovine TB-free. The loss of TB-free status has resulted in decreased ability to market Michigan cattle. It has also added to the cost of production by increased testing, veterinary services, and loss of revenue from national and international cattle related events.

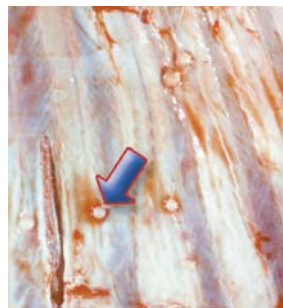


The eradication of bovine TB is necessary for a variety of reasons, including the reputation of Michigan's quality agricultural products and the health of the state's natural resources.

Signs of Bovine TB:

Although TB in humans can be treated, bovine TB is a chronic, incurable, infectious disease of animals.

Animals infected with bovine TB may appear perfectly normal, may lose weight, have trouble breathing, or look chronically ill. TB lesions may be found in any organ or body cavity of infected animals, but are frequently located in the lungs, chest cavity, and lymph nodes of the neck. Because the lungs are commonly infected, the animal may cough and have difficulty breathing.



How is Bovine TB Spread?

Bovine TB is primarily spread in two ways: direct nose-to-nose contact between animals or more commonly, by ingestion of feed or water contaminated with the bovine TB bacteria. Invisible droplets (aerosols) containing bovine TB bacteria may be exhaled or coughed out by TB infected animals. These aerosols can be inhaled by other animals or humans, or can be left on hay, or other feed and water. Livestock can become infected by drinking water or eating feed contaminated with aerosols, saliva, or other discharges from infected animals.



Bovine TB rarely infects humans from direct animal-to-human contact, however, people who drink unpasteurized milk, or eat cheese made from unpasteurized milk, from bovine TB infected cows are at risk for becoming infected. In addition, people who consume raw or undercooked meat from infected animals are also at risk. In a very rare

situation, one Michigan deer hunter developed TB lesions on his hand after cutting himself while field-dressing an infected deer. [Another person, who died from an unrelated illness, was also infected with the Michigan strain of bovine TB \(exact source of exposure unknown\).](#)

While our ongoing bovine TB eradication efforts have reduced the risk to people here in Michigan, it continues to be a very significant threat to public health around the world.

Why is Testing for bovine TB Crucial?

Bovine TB is not a new problem in Michigan, the United States, or the world. Bovine TB was found in dairy and beef cattle throughout the United States during the mid 20th century. According to the USDA, in the early 1900's, bovine TB caused more losses of livestock than all other livestock diseases combined. This prompted the establishment of the National Cooperative State/Federal Bovine Tuberculosis Eradication Program for bovine TB in livestock in 1917. Michigan was originally declared free of bovine TB in cattle and bison in 1979.

In 1994, bovine TB was discovered in one wild white-tailed deer in the northeast corner of Michigan's Lower Peninsula. Historically, bovine TB has been a rare disease in wild deer. In North America, only eight wild white-tailed or mule deer had been reported infected with bovine TB, prior to 1994. Michigan was the first state in the U.S. to identify that wild white-tailed deer could be a reservoir of bovine TB and that the infection could spread between deer and cattle. Recently, Minnesota became the second state to identify bovine TB in the wild deer population. In Canada, wild elk have become a reservoir for bovine TB.

Michigan scientists recognized the need to be proactive in monitoring this disease, and decided to test cattle and deer in a small area of northern lower Michigan. As a result of testing, bovine TB was confirmed in a beef cow in Alpena County in June 1998. Since that time, TB infection has been confirmed in



more than 40 cattle herds in northern Lower Michigan. All herds have been depopulated or tested clear. Bovine TB has also been detected in privately owned cervid herds, as well as wild deer and elk, carnivores (bear, coyote, and bobcat), and small mammals (raccoons and opossum), and in one case a domestic outdoor cat.

In an intensive effort to eradicate bovine TB in livestock, the Michigan Department of Agriculture (MDA), working with the U.S. Department of Agriculture (USDA), Michigan State University, and private veterinarians, launched a statewide livestock testing program in 2000. Mandatory TB testing for all cattle, bison, goat and privately owned cervid herds in the state of Michigan was completed in December 2003. Since 2003, random surveillance testing has demonstrated bovine TB has not been found outside the Modified Accredited Zone (MAZ) in the northern Lower Peninsula. Starting in 2008, risk-based surveillance testing will be used to focus resources on areas at highest risk.

What are Michigan's TB zones?

At the national level, USDA lowered Michigan's bovine TB status and divided the state into zones. Animals within the zones need to meet certain requirements to move off the farm or between zones. Dividing the state into different zones and the zonal requirements helps prevent the spread of disease.

Currently Michigan has three zones:

- **TB Free Zone:** The Upper Peninsula is Michigan's bovine TB-Free Zone.
- **Modified Accredited Zone (MAZ):** The Modified Accredited Zone (MAZ) is the area known to have bovine TB in cattle and deer. The MAZ is located in the northern Lower Peninsula.
- **Modified Accredited Advanced Zone (MAAZ):** All counties in Lower Michigan not in the MAZ are in the Modified Accredited Advanced Zone.



Zone boundaries may change. Go to www.michigan.gov/emergingdiseases for updates.

Michigan cannot regain bovine TB-free status for the entire state until testing and surveillance demonstrates there is no TB in the cattle herds of Michigan. Other states can impose additional testing requirements, as long as they are more stringent than USDA requirements. Until bovine TB is eradicated, other states will continue to impose strict importation requirements on Michigan cattle adding additional financial and time burdens to the state's cattle industry.

Why is Radio Frequency Identification (RFID) necessary?

On March 1, 2007, Michigan became the first state in the nation to require all cattle and bison moving from the farm of origin be tagged with a radio frequency identification (RFID) ear tag. Michigan's RFID Program is a major part of the state's bovine TB eradication plan. RFID incorporates the latest technology: a tag imbedded with a radio frequency device containing a unique, individual number that will



not be duplicated on any other tag anywhere in the world. Therefore, each animal with an RFID tag has a unique identification. Each RFID tag is associated with a specific farm. After bovine TB testing the RFID number is entered into a database and provides information about the age, sex, species, breed and bovine TB test status. This RFID system dramatically speeds up the location and tracing of livestock, and ensures the most accurate and up-to-date information. Electronic identification provides state and federal regulators and the livestock industry the ability to quickly track the movement of individual animals from the farm to market and is an important tool in the ability to quickly identify and test animals that may have been exposed to bovine TB.

What is premise identification and why is it needed?

Premise identification (ID) allocates a specific number to a specific farm. The premise ID number is unique and no one else in Michigan has the same number. RFID tags can only be obtained if the farm has a premise ID number and the tags are assigned to a specific premise number. Therefore, if there is an issue with an animal, the RFID tag can be immediately identified to the farm of origin and tracing the animal's movement can be rapidly done. This prevents spread of disease and greatly aids tracing animal movements from farm to slaughter.

To obtain a premise ID number or order RFID tags, call 866-870-5136. To order RFID tags contact the Holstein Association at 800-952-5200.

What are the animal identification requirements for TB testing?

All cattle in the MAZ are required to have RFID prior to TB testing. For TB testing in the MAAZ and Free Zone, all cattle must be officially identified. For cattle that do not leave the farm, this official identification can be RFID, USDA alphanumeric metal silver ear tags, USDA alphanumeric metal orange Bang's tags, or breed registration tattoo that matches exactly the tattoo on listed on the registration papers. For movement off the farm, all cattle in Michigan must have an RFID tag.

Surveillance for bovine TB:

The bovine TB eradication effort requires continued testing of cattle outside of the MAZ. Since 2003, a random surveillance system has been used to determine if TB was present outside the MAZ. This computer generated system picked herds at random based on the number of herds in each region. To increase the ability to detect bovine TB in cattle (if it is present) and to focus resources in areas where the risk of bovine TB is greatest, the MDA has moved from random surveillance to risk-based surveillance.

What is risk-based surveillance?

Risk-based surveillance is basically bovine TB testing those cattle herds at greater risk for exposure to bovine TB. Cattle at greater risk for bovine TB are those from the MAZ, those in counties near the MAZ, those that originated from an infected herd, and those in proximity to deer infected with bovine TB.

Risk-based surveillance in the MAAZ and bovine TB-Free Zones will be used to monitor cattle herds potentially exposed to bovine TB.

Risk-based surveillance is a useful tool to identify and test cattle potentially at a higher risk for bovine TB infection.

What are movement certificates and who needs them?

Movement of infected cattle can be a way to spread disease from one herd to another. Movement certificates are one way to ensure if an animal or herd is found to be infected, other herds that may be exposed can be identified and protected quickly. In order for Michigan to continue the current split state status, or obtain bovine TB Free status in the MAAZ, USDA is requiring movement certificates for cattle. Movement certificates are a way to quickly trace cattle that may have been exposed to bovine TB.

Movement certificates are required whenever cattle are moved across a bovine TB zone boundary, (i.e. when moving from the MAAZ to the TB Free Zone). Requirements for movement certificates vary with the zone, the herd of origin and the destination. Bovine TB testing may be required prior to obtaining a movement certificate.

Movement certificates may be obtained from MDA by calling 517-373-1077 or 866 870-5136 Monday through Friday from 7:30 am to 5 pm or online at the Farm Animal Identification and Records (FAIR) database – www.nationalfair.com.

For more information on movement certificates go to www.michigan.gov/emergingdiseases and click on Bovine TB Zoning Rules

What to Expect on Testing Day

Step-By-Step Testing Procedures

Phase I

On-farm Caudal Fold Tuberculin Test

- **The Caudal Fold Tuberculin Test (CFT test)** is the first screening step in the TB-testing process. Screening tests, by their nature, are designed to cast a wide net – they will identify some animals that are NOT infected with bovine TB.
- Animals are tested individually, by an accredited veterinarian, and must be restrained and secured prior to testing.
- Once the animal is secured, the CFT test is administered. **The Purified Protein Derivative (PPD)** tuberculin is injected intradermally (between the layers of the skin) to one side of the caudal fold, under the animal's tail.
- The side of the injection and the animals identification numbers and description are written down.
- When each animal in the herd has been injected, the injection portion of the test is complete.
- The CFT test must be “read” 72 hours (66 to 78 hours) later by the same veterinarian who injected the PPD.



- Once the animal is secure, the test of each animal is read individually.
- Reading the test involves both looking at and feeling the injection site.
- In the majority of cases the CFT test is negative – there is no response to the PPD and this is the end of testing for that animal.
- Because the CFT is a screening test, five to seven percent of the cattle will have a response to the PPD, usually due to exposure to other types of bacteria, but only a very few are actually infected with bovine TB.
- If there is swelling, redness, hardness, or a bump, etc. at the injection site, the animal has “responded” to the PPD and is considered a responder.
- Further testing is required of responder animals.
- When an animal is identified as a responder, the entire herd is quarantined. This means no animals can come into the herd and no animals can move out of the herd.

Phase II

On-farm Comparative Cervical Tuberculin (CCT) Test OR Gamma Interferon Test

The next phase of testing is only done on animals that are responders on the CFT test. At this point, there are two different tests that may be used: (1) the comparative cervical test (CCT test) and (2) the gamma interferon test. The CCT is only done by state or federal veterinarians and involves two farm visits. The gamma interferon test is a blood test, can be done by accredited private veterinarians, and involves only one farm visit. In some cases the producer may choose which test they would prefer. **Only one of these tests may be used at a time on a herd.**

On-farm Comparative Cervical Tuberculin Test:

- **The Comparative Cervical Tuberculin Test (CCT test)**
 - Is done only on CFT test suspects.
 - Must be done within 10 days of the injection date of the CFT test (one week after the reading of the CFT test).
 - If not done within 10 days it cannot be done until after 60 days
 - The herd remains quarantined until testing is completed
- Animals are tested individually, by a state or federal veterinarian, and must be restrained and secured prior to testing.
- A section of the neck is shaved in two places and skin thickness is measured and recorded for both places.
- The veterinarian injects avian (bird) tuberculin into one shaved area and bovine (cattle) tuberculin into the other shaved area.
- The tuberculin is injected between the skin layers (intradermally).
- The same veterinarian who administered the CCT test must measure the skin thickness at the injection sites 72 hours (66 to 78 hours) after injection.
- The results of the skin thickness measurements are plotted on the official USDA CCT scattergram. Based on where the measurements are plotted, the animal is classified as negative, suspect or reactor.



CCT test results:

- **Negative:** Animals classified as negative on the CCT test are considered TB negative. If the entire herd tests negative, the quarantine is released and animals can move off or onto the farm.

- **Suspect:** An animal whose response to the CCT test is plotted midway on the graph is classified as a suspect. The herd owner has two options and must decide: (1) to have the suspect animal removed from the herd for euthanasia, necropsy and testing at MSU **OR** (2) to re-test the animal on the farm after 60 days.
 - If the herd owner decides to have the animal removed for necropsy and further laboratory tests, the herd owner will receive payment for the animal based on the value of the animal. The herd will remain under quarantine until at least initial laboratory test results are available.
 - If the herd owner opts for a 60-day retest, the herd will remain under quarantine until the second CCT test results are available. If the animal tests negative on the second CCT test, the animal is considered negative for TB and the quarantine is removed. Any animal that responds as a suspect to two CCT tests is reclassified as a reactor (see below), and arrangements for removal from the farm are made, with indemnification and shipping paid according to state and federal regulations.
- **Reactor:** An animal can be classified as a reactor in two ways: (1) if its response to the CCT test plots in the reactor range on the official USDA CCT scattergram **OR** (2) if it plots as a suspect on the scattergram on two separate CCT tests.
- Since bovine TB in animals can only be verified after death, classification as a reactor does not prove the animal has bovine TB. However, milk from reactor animals cannot be put into the milk bulk tank or consumed by humans or animals. Livestock producers are advised to keep reactor animals confined and separated from the rest of the herd.
- Arrangements will be made for reactor animals to be removed from the farm for necropsy and further laboratory tests. The



herd remains quarantined until the laboratory test results are available. Herds that have a reactor animal may be required to have a whole herd TB test 60 days after the animal is removed from the farm.

For more information about animal purchase prices, please refer to the Indemnification definition in the back of the book.

On-farm gamma interferon test:

- **The Gamma Interferon Test** is done only on cattle (not other species) that respond to the caudal fold test.
- This is a blood test and might be considered a “test tube version of the CCT test.”
- The gamma interferon test measures whether the animal’s white blood cells can produce gamma interferon in response to different kinds of tuberculin.
- A blood sample can be drawn at the same time as the CFT test is read or anytime within 30 days of the CFT injection.
- It usually takes five to seven days from the time the blood is submitted to the lab until the results are available to the producer.
- The results of the gamma interferon test can be negative (the animal is cleared and the testing process is done) or suspect.

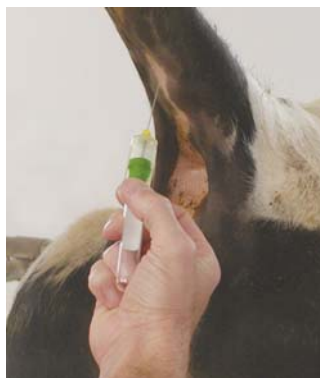


Photo: Dr. Dan Grooms, MSU

Gamma interferon test results:

- **Negative:** If the test is negative the animal is cleared, the testing process is done, and the quarantine is released.
- **Suspect:** If an animal is considered a suspect on the gamma interferon test, the herd owner has two options and must decide: (1) to have the suspect animal removed from the herd for euthanasia, necropsy and testing at MSU **OR** (2) to re-test the animal on the farm with the gamma interferon test anytime within 30 days from the CFT test injection.

- **Reactor:** If the animal is still a suspect after a second gamma interferon test it will be classified as a reactor. Reactor animals on the gamma interferon test are handled exactly like reactor animals on the CCT test.

Phase III

Necropsy and Laboratory Testing

When animals are removed from the farm for further testing, they first go to the Diagnostic Center for Population and Animal Health at Michigan State University for necropsy (equivalent to human autopsy), histopathology, culture and special DNA based tests. The necropsy evaluates the internal organs and looks for signs of disease. Tissue samples are collected for additional testing. (Please refer to the definition section of this brochure for detailed descriptions of the laboratory tests.)

Depopulation

When a farm owner is notified that an animal has bovine TB, the herd may be depopulated. Depopulation, as defined by the USDA Bovine TB Eradication Uniform Methods and Rules, is the destruction of all susceptible livestock exposed to bovine tuberculosis in the herd before any restocking of the premises with cattle, bison or privately owned cervids. Humane destruction of all infected animals and any exposed susceptible animals is the only proven way to eliminate the disease. All exposed animals, including those that may have been sold, will be purchased and tested.



When the farm is depopulated, MDA or USDA purchases all livestock from the producer. The livestock are removed from the premises and sent to Michigan State University for necropsy and further testing. The farm is disinfected and may be repopulated as soon as an USDA Designated Tuberculosis Epidemiologist determines the premises are clean and free of the risk of re-infection or one year after removal of all the animals.

Specific herd plans designed to prevent infection from livestock or wildlife sources are required prior to allowing repopulation of the farm.

Definitions

Acid-Fast Test

Tissue samples collected during necropsy are stained with an acid fast stain and then examined under the microscope. Acid fast is a stain used to identify some bacteria, this stain clings to TB and other related bacteria, coloring them and making them easier to recognize.

Caudal Fold Tuberculin (CFT) Test Responder

Any cattle or bison that shows a response to the caudal-fold tuberculin test.

Comparative Cervical Tuberculin (CCT) Test Negative

The CCT test is only done on animals that respond to the CFT test (see above) and compares responses to bovine (cattle) and avian (bird) tuberculin after injection in separate sites in the cervical (neck) area. Classification is based on measurement of the skin thickness at each site and plotting this information on the official USDA CCT scattergram.

CCT negative - if plotted in the negative zone, the animal is classified as bovine TB negative.

CCT suspect - If plotted in the suspect zone, the animal is classified as bovine TB suspect. Animals classified as bovine TB suspect by the CCT test can be re-tested by the CCT test at least 60 days after the first CCT test injection or taken and submitted directly to an appropriate diagnostic lab for further testing. Animals classified as suspect on a second CCT test are automatically reclassified as reactors and subject to the rules and regulations governing this classification.

CCT reactor - If plotted in the reactor zone, the animal is classified as a bovine TB reactor. Animals classified as a suspect on two sequential CCT tests at least 60 days apart are automatically reclassified as a reactor. Animals classified as reactors are subject to the rules and regulations governing this classification. Animals classified as bovine TB reactors are quarantined to the premises until the animal can be removed and sent to the laboratory at MSU.

Culture

Culture is a way to grow bacteria in the laboratory. Samples for bovine TB culture are sent to the National Veterinary Services Laboratory in Ames, Iowa. Since bovine TB is a very slow growing bacteria, it may take up to 90 days or longer to get results. The culture is a useful tool in the diagnostic process and can also provide useful information about the particular strain of TB.

Depopulation

The removal and destruction of all livestock in a herd.

Disease surveillance

Continuous monitoring of disease occurrence within a population; in the case of bovine TB this monitoring involves the various forms of tests described in this booklet. Continuous monitoring of disease occurrence within a population; in the case of bovine TB this monitoring involves the various forms of tests described in this booklet.

Euthanasia

Bringing about humane death.

Epidemiology

The science that deals with the incidence, distribution and control of disease in a population. An epidemiologist will consider all of the factors surrounding the presence of bovine TB on a farm including exposure to wildlife, tracing movement of livestock on or off a property and housing conditions.

Exposed animals

Any livestock exposed to bovine tuberculosis due to interaction with other livestock that were infected (with bovine TB)

Gamma interferon (GI) test

This test is only done on cattle that respond to the CFT test (see above) and is a blood test that can be considered a “test tube version” of the CCT test. It measures the ability of bovine white blood cells to make interferon in response to different kinds of tuberculin. Once blood has been drawn, a regulatory veterinarian compares the responses and classifies the animal as negative or suspect.

GI negative - If classified as negative the animal is cleared and the quarantine released.

GI suspect - animals classified as bovine TB suspect by the gamma interferon test can be re-tested by the gamma interferon test anytime within 30 days of the CFT injection or taken and submitted directly to an appropriate diagnostic lab for further testing. Animals classified as suspect on a second gamma interferon test are automatically reclassified as reactors and subject to the rules and regulations governing this classification.

Payment to the producer for the purchase of livestock. Payment is based on the value of the animal according to state and federal regulations.

Risk-based surveillance

Monitoring for a disease by testing those animals at highest risk for being exposed to the disease. Monitoring for a disease by testing those animals at highest risk for being exposed to the disease.

Strain typing

If *M bovis* is grown on a culture its DNA make-up is determined by genetically fingerprinting the strain of organism. All of the animals in Michigan thus far have the same *M bovis* strain of infection.



A Commitment to Safety

The Bovine TB Eradication Project maintains a strong commitment to eradicating bovine TB from Michigan livestock and free-ranging deer. In keeping with its long-standing tradition of making food safety a top priority, MDA pledges an equally rigorous effort to continue ensuring the safety of venison, beef, and milk, through comprehensive testing, monitoring and educational efforts from the farm or processing plant to the retail store.

The Bovine TB Eradication Project involves a multi-agency team of experts from the Michigan Departments of Agriculture, Natural Resources and Community Health, Michigan State University, and the U.S. Department of Agriculture.



Contact Information

Michigan Department of Agriculture
Animal Industry Division

517-373-1077

Michigan Department of Agriculture
Atlanta Regional Office (for movement permits)

989-785-5616

Michigan Department of Community Health
Communicable Diseases

517-335-8165

Michigan Department of Natural Resources
Wildlife Disease Lab

517-336-5030

Michigan State University

Contact your local county extension agent or College of
Agriculture and Natural Resources Communications at:


231-839-3001 or 989-826-1160

United States Department of Agriculture

517-324-5290

Detailed information about bovine TB eradication efforts may
also be found at the Department of Natural Resources' web site
at **www.michigan.gov/dnr** or at

www.michigan.gov/emergingdiseases

A photograph of a herd of cattle grazing in a field at sunset. The scene is bathed in a warm, golden light, with silhouettes of trees in the background.

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